

Version 5 RTA Upgrades

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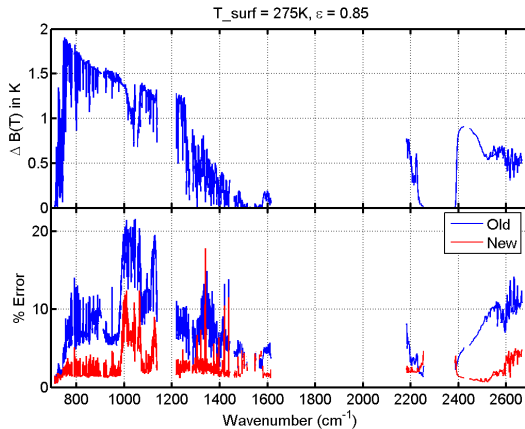
March 29, 2007

- Reflected thermal
- Non-LTE
- Minor gas variability added
- Transmittance adjustments

- Non-LTE (with Lopez-Puertas, Funke, Edwards)
- Reflected thermal
- New transmittance adjustments (with Maddy and Barnett)
- More minor gases can be varied
- M12 (649-682 cm^{-1}) channel centers fixed

Note: 0.2K tough (2% absolute accuracy) with fundamental lab spectroscopy!

- Reflected thermal more realistic, downward radiation computed similarly to upward.

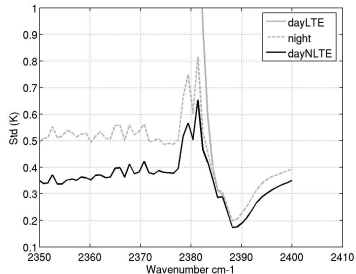
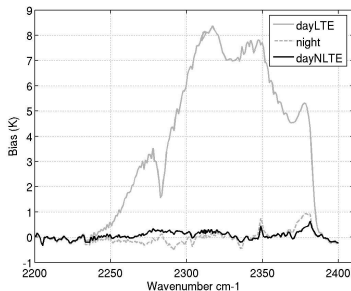


- Module-12 ($649\text{-}682\text{ cm}^{-1}$) center wavenumbers shifted by $\sim 1.5\%$ of a SRF FWHM.

- CO₂ can now be adjusted on all 100 layers, previously limited to a single scale factor for the whole profile
- N₂O, SO₂, and HNO₃ profiles can now be varied.

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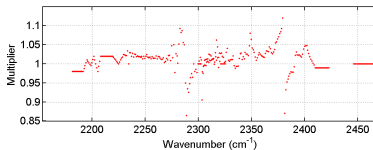
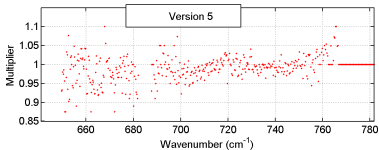
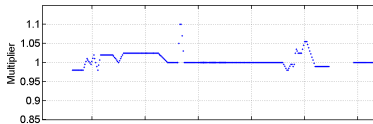
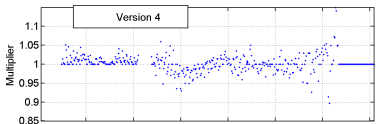


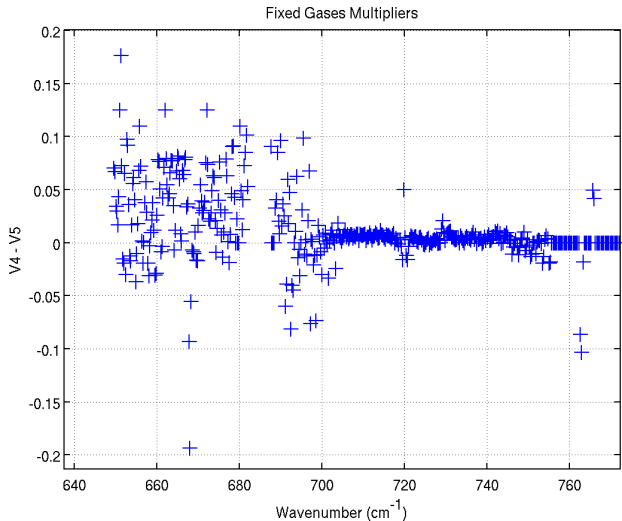
- Lack of truth in the stratosphere (Use GPS in future?)
- Retrieve (w/ V4-RTA) strat profiles for RS-90 val data.
- Replace ECMWF with these retrievals above ~ 60 mbar.
- Re-derive transmittance tuning (with TWP-1) for channels that span the 60 mbar switchover.
- Channels above 60 mbar remain unvalidated, channels that span 60 mbar remain partially unvalidated/uncorrected.
- NOAA-CMDL MBL (Marine Boundary Layer) used for CO_2 .
- Test RTA with TWP-2, TWP-3, Minnett, ABOVE, etc.
- Minor changes to H_2O and CH_4 lines in 1320 cm^{-1} region (due to HNO_3).
- Very minor change to window H_2O continuum (again, due to HNO_3)
- New O_3 transmittances from HITRAN2004 included via transmittance adjustments.

Sample Transmittance Adjustments

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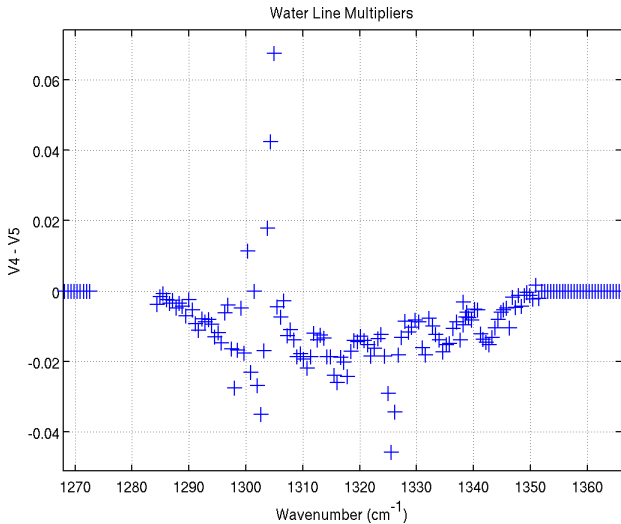
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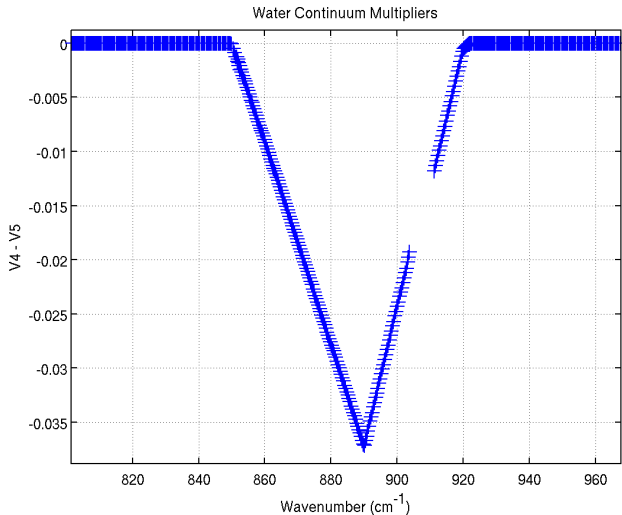
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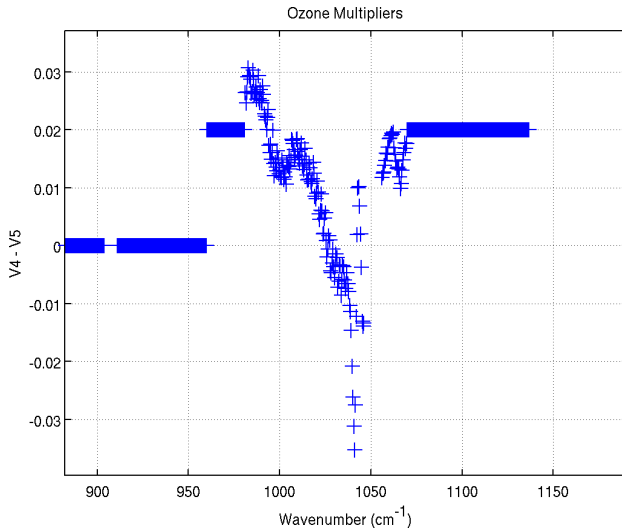
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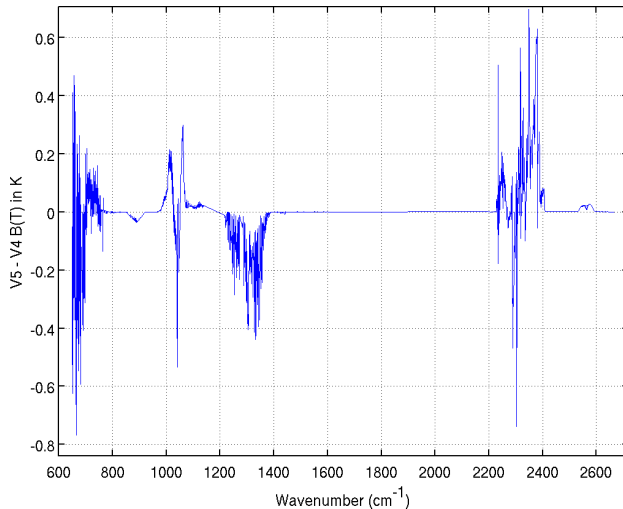
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V5 - V4 Regression Profile $\Delta B(T)$ s

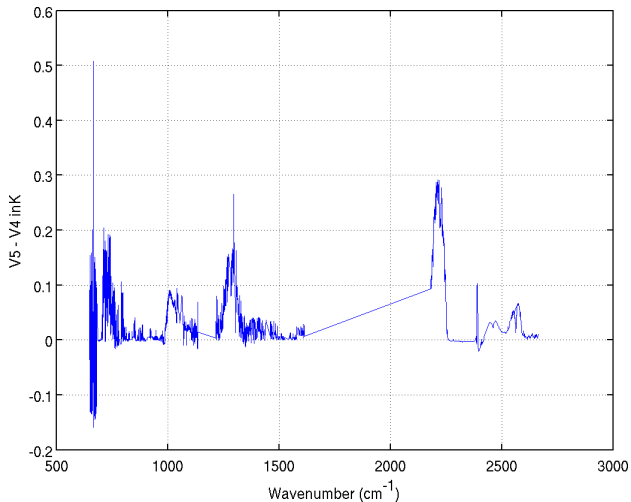
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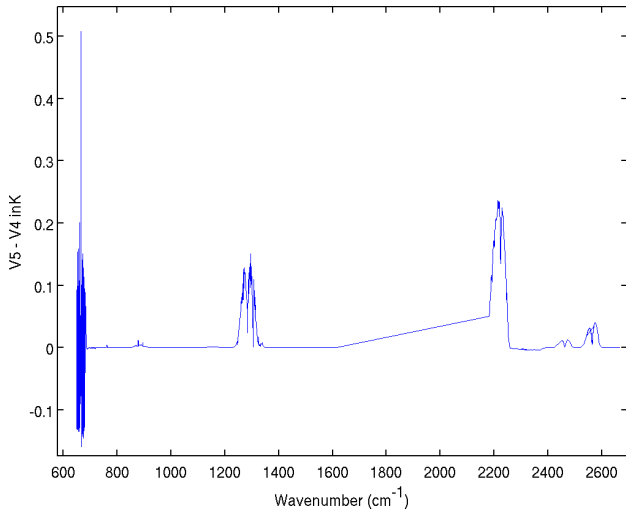
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Polar Cases: V5 - V4: emis = 1; N2O is AFGL Polar

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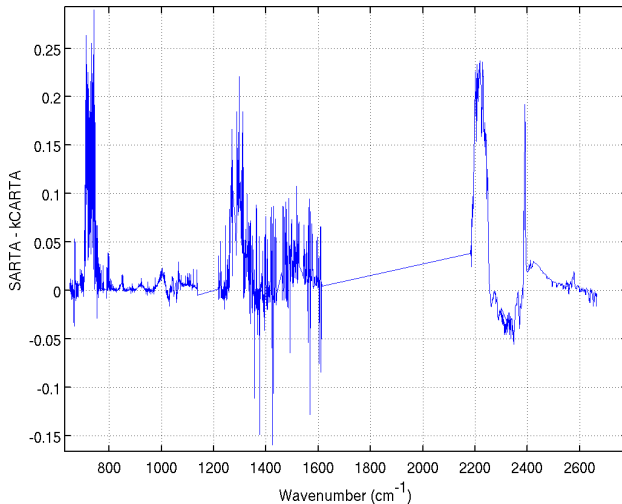


Polar Cases: SARTA - kCARTA

Reflected thermal, RTA fit errors, N₂O, ..?

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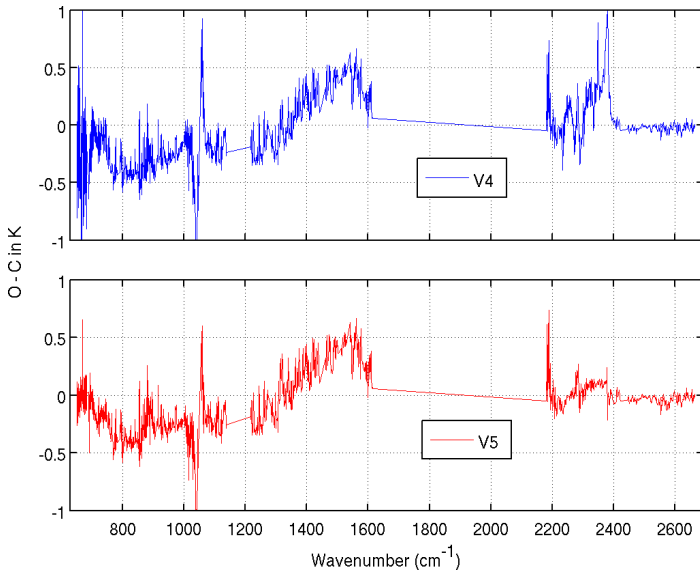
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V5 versus V4 Bias, Ocean, Night RS-90's

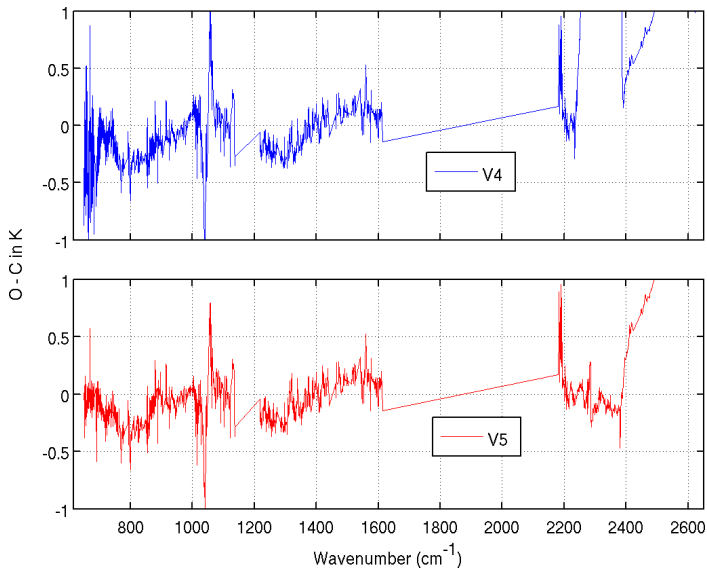
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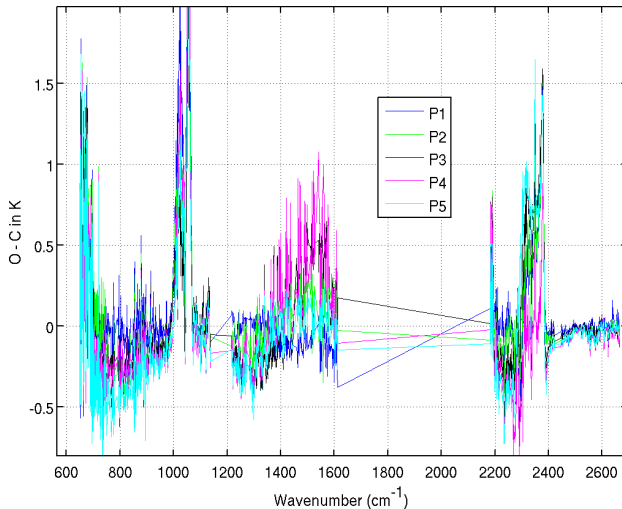
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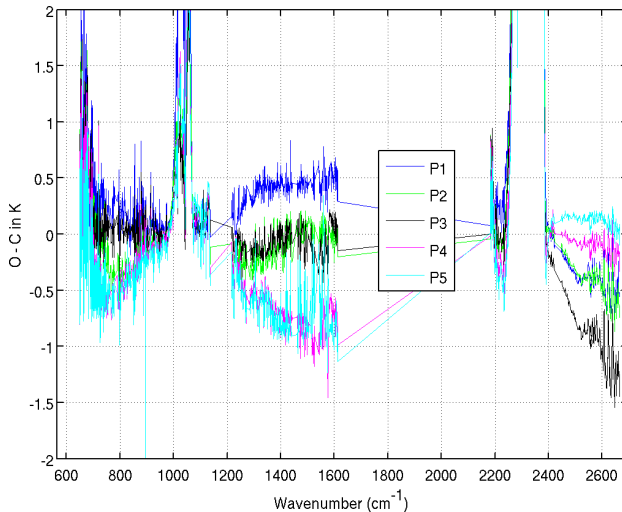
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- Need to reconsider all transmittance adjustment
 - Up to V5 of ARM Obs: only used V1-V3 so far
 - Look at operational sondes?
 - Intercompare AIRS with IASI with regard to RTA issues (use ECMWF for intercomparisons for now)
 - Need to be sure stratospheric “truth” well understood
 - Fix ozone via HITRAN instead of multipliers
- Non-LTE; examine over wide range of conditions
- Variable N₂O, HNO₃ in polar regions where need to test RTA parameterization and reflected thermal carefully
- Cloud/Aerosols?

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